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10/796,540

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Phan Hoang

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EXAMINER

VIGUSHIN, JOHN B

ART UNIT

PAPER NUMBER

2841

DATE MAILED: 04/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/796,540

Applicant(s)

HOANG ET AL.

Examiner

John B. Vigushin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 7, 10-14, 16, 17, 20-24, 26, 27 and 30 is/are rejected.
- 7) ☒ Claim(s) 5, 8, 9, 15, 18, 19, 25, 28 and 29 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. The following objections are based on 37 CFR § 1.75(a):

In Claim 6, "the third contact elements" has no antecedent basis in base and intervening Claims 1 and 2. The rejection may be overcome by changing the dependency in Claim 6 from "claim 2" to —claim 3—.

In Claim 16, "the third contact elements" has no antecedent basis in base and intervening Claims 11 and 12. The rejection may be overcome by changing the dependency in Claim 16 from "claim 12" to —claim 13—.

In Claim 26, "the third contact elements" has no antecedent basis in base and intervening Claims 21 and 22. The rejection may be overcome by changing the dependency in Claim 26 from "claim 22" to —claim 23—.

Appropriate correction is required.

Rejections Based On Prior Art

2. The following references were relied upon for the rejections hereinbelow:

Kornrumpf (US 5,345,205)

Solberg (US 6,121,676)

Emoto (US 6,717,250 B1)

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 3, 4, 7, 10, 11, 13, 14, 17, 10, 21, 23, 24, 27 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Kornrumpf.

As to Claims 1 and 11, Kornrumpf discloses: a flexible circuit 130 (Figs. 1 and 7; col.10: 5-17) having first, second and third portions, the first (middle) portion (Fig. 1) being folded on an upper surfaced of the third (bottom) portion and having first contact elements 134V attached to a first device (module 102 comprising chips 120; Fig 3 shows a step in the package fabrication and Fig. 7 shows a condensed drawing of the flex circuit 130 with modules 101, 102 and 103 and the first contact elements 134V that connect the flex circuit 130 with each of the modules, including module 102; Fig. 1 shows the finished assembly; col.11: 50-col.12: 15), the second (upper) portion (Fig. 1) being folded on the first device 102 and having second contact elements 134V (Fig. 7) attached to a second device (module 103 comprising chips 120); and a stiffener 106 (Fig. 1; col.10: 13-21) attached to the upper surface of the third (bottom) portion and located between the upper surface of the third (bottom) portion and the first (middle) portion (Fig. 1).

As to Claims 3, 13 and 23, Kornrumpf further discloses, in Figs. 1 and 7, the third (bottom) portion of flex circuit 130 has a lower surface having third contact elements 134V (which connect to the chips 120 of module 101).

As to Claims 4, 14 and 24, Kornrumpf further discloses, in Figs. 1 and 7, the lower surface is attached to a third device (module 101) via the third contact elements 134V.

As to Claims 7, 17 and 27, Kornrumpf further discloses the first, second and third portions include first, second and third layer having signal traces 134 mapped to the first, second and third contact elements 134V, respectively (Fig. 7; col.11: 62-col.12: 15).

As to Claims 10, 20 and 30, Kornrumpf further discloses that stiffener 106 is strictly a support structure for maintaining the shape (curvature) of the flex circuit 130 (col.10: 18-31) and further renders the region of stiffener 106 with the standard alternating heavy and light slanted lines in Fig. 1, thus representing stiffener 106 as a synthetic resin or plastic insulating material, in accordance with 37 CFR 1.84(n) and the graphical symbol guidelines indicated in MPEP § 608.02, section IX.

As to Claim 21, Kornrumpf discloses: a first device (module 102 comprising chips 120) and a second device (module 103 comprising chips 120); and a stacking element to stack the second device 103 on the first device 102 (Figs. 1, 3 and 7), the stacking element comprising: a flexible circuit 130 (Figs. 1 and 7; col.10: 5-17) having first, second and third portions, the first (middle) portion (Fig. 1) being folded on an upper surfaced of the third (bottom) portion and having first contact elements 134V attached to

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a first device (module 102 comprising chips 120; Fig 3 shows a step in the package fabrication and Fig. 7 shows a condensed drawing of the flex circuit 130 with modules 101, 102 and 103 and the first contact elements 134V that connect the flex circuit 130 with each of the modules, including module 102; Fig. 1 shows the finished assembly; col.11: 50-col.12: 15), the second (upper) portion (Fig. 1) being folded on the first device 102 and having second contact elements 134V (Fig. 7) attached to a second device (module 103 comprising chips 120); and a stiffener 106 (Fig. 1; col.10: 13-21) attached to the upper surface of the third (bottom) portion and located between the upper surface of the third (bottom) portion and the first (middle) portion (Fig. 1).

5. Claims 1-3, 6, 11-13, 16, 21-23 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Emoto.

As to Claims 1 and 11, Emoto discloses, in Fig. 3: a flexible circuit 3 (col.5: 13-15) having first, second and third portions, the first portion (the horizontal portion carrying device 5c) being folded on an upper surface of the third portion (the horizontal portion carrying interposer 7) and having first contact elements (included in wiring 15 and connected to device electrodes 17; Figs. 1 and 3; col.5: 15-22) attached to the electrodes 17 of a first device 5c, the second portion (carrying device 5a) being folded on the first device 5c and having second contact elements included in wiring 15 and attached to electrodes 17 of a second device 5a (Figs. 1 and 3; col.5: 15-22); and a stiffener (interposer 7 inherently adds mechanical strength to—i.e., “stiffens”—the flex circuit 3) attached to the upper surface of the third portion and located between the upper surface of the third portion and the first portion (Fig. 1).

As to Claims 2, 12 and 22, Emoto further discloses an encapsulant 23 to encapsulate flex circuit 3 and first and second devices 5c and 5a (Fig. 3; col.5: 64-col.6: 1).

As to Claims 3, 13 and 23, Emoto further discloses the third portion has a lower surface having third contact elements (i.e., the pads of wiring 15, best seen in Fig. 3, that carry solder balls 11; col.5: 18-19).

As to Claims 6, 16 and 26, Emoto further discloses the third contact elements comprise a plurality of solder pads that carry solder balls 11 (Fig. 3; col.4: 55-58 and col.5: 18-19).

As to Claim 21, Emoto discloses a first device 5c and a second device 5a; and stacking element to stack the second device 5a on the first device 5c, the stacking element comprising: a flexible circuit 3 (col.5: 13-15) having first, second and third portions, the first portion (the horizontal portion carrying device 5c) being folded on an upper surface of the third portion (the horizontal portion carrying interposer 7) and having first contact elements (included in wiring 15 and connected to device electrodes 17; Figs. 1 and 3; col.5: 15-22) attached to the electrodes 17 of a first device 5c, the second portion (carrying device 5a) being folded on the first device 5c and having second contact elements included in wiring 15 and attached to electrodes 17 of a second device 5a (Figs. 1 and 3; col.5: 15-22); and a stiffener (interposer 7 inherently adds mechanical strength to—i.e., “stiffens”—the flex circuit 3) attached to the upper surface of the third portion and located between the upper surface of the third portion and the first portion (Fig. 1).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 4, 7, 10, 14, 17, 20, 24, 27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Emoto in view of Solberg.

A) As to Claims 4, 14 and 24:

I. Emoto discloses that the lower surface of the third portion is attached to an external device via the third contact elements (solder pads) but does not specify the external device to which the stacked flex circuit package is connected. However, Emoto does teach that the stacked flex circuit package is applied to the electronic system of a small computer 50 (Fig. 4; col.6: 31-35).

II. Solberg discloses a flexible circuit 10 that is folded into a multichip package (col.8: 3-12), similarly to Emoto, having a bottommost portion of the flex circuit comprising solder balls 22 that connect the flex circuit package to a printed circuit board 48 (col.8: 38-44).

III. Since both Solberg and Emoto teach a stacked flexible circuit package for mounting to an external electronic element in an application, then the mounting of a printed circuit board for an electronic application, as taught by Solberg, would have been readily recognized in the pertinent art of Emoto for application to an expansion board or the motherboard of the computer application taught therein.

IV. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to mount the stacked flexible circuit package of Emoto to a printed circuit board via the third contact elements, as taught by Solberg, in order to electrically connect the stacked flexible circuit package to an expansion or system board of the computer to which the functionality of the stacked flexible package of Emoto is being applied.

B) As to Claims 7, 17 and 27, modified Emoto further discloses the first, second and third portions include first, second and third layer having signal traces 15 mapped to the first, second and third contact elements, respectively (col.5: 18-22).

C) As to Claims 10, 20 and 30:

I. Emoto discloses that both the flexible circuit 3 and interposer/stiffener 7 are made of a tape material (col.3: 59-63) but does not identify the tape material(s).

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Interposer 7 is electrically connected to the electrodes 17 of stacked chip 5d (col.3: 67- col.4: 2) and the solder balls 11 (col.4: 55-58) through the wiring 15.

II. Solberg discloses that the flex circuit is a tape (col.8: 3-6) made of an insulating (polymeric) material (col.2: 31-33).

III. Since both Emoto and Solberg teach flex circuit tapes for use in forming stacked packages, and since the interposer/stiffener of Emoto is used as a circuit element that is electrically connected to the chip electrodes and external connection solder pads, and furthermore is itself made of a tape material, then the use of a polymeric insulating tape material, as taught by Solberg, would have been readily recognized for use in the interposer/stiffener tape of Emoto as an insulating material for both the electrical application of the interposer as well as the inherent stiffening support for the flex circuit.

IV. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polymeric tape material, as taught by Solberg, for the insulating material of the tape interposer/stiffener of Emoto, in order to provide the necessary electrical insulation between the wiring lines and pads of the interposer/stiffener that are connected to the discrete third contact elements (solder pads) of the third (bottommost) portion of the flex circuit and to the electrodes of the stacked chips along the flex circuit.

Allowable Subject Matter

9. Claims 5, 8, 9, 15, 18, 19, 25, 28 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


Kim et al. (US 6,225,688 B1) [*CIP of US 6,121,676 to Solberg, relied upon for some of the rejections set forth above*] discloses a metallic stiffener 860 on the bottommost portion of a folded flex circuit 810 that forms a stacked chip package (Fig. 19; col.12: 32-38).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Vigushin whose telephone number is 571-272-1936. The examiner can normally be reached on 8:30AM-5:00PM Mo-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


John B. Vigushin
Primary Examiner
Art Unit 2841

jbv
April 01, 2006